

# Adaptive Welding for Submarine and Carrier Fabrication

**Status:** Technical Success

## PROBLEM / OBJECTIVE

Reducing the cost of welding is a key goal to achieve Navy requirements for decreased acquisition costs and construction time for submarines and aircraft carriers. The objective of this project is to improve the quality and productivity of arc welding operations for Navy ship structures through the development of an intelligent, portable, real-time, adaptive welding system.

## ACCOMPLISHMENTS / PAYOFF

### ***Process Improvement:***

This project developed new technology that extends the application of intelligent, portable, real-time, adaptive control to multi-pass groove welds for Navy ship and submarine structures. Results of this work include enhanced vision templates for the weld vision system, an adaptive weld model, and software that permits adaptive control of welding voltage, wire feed speed, and oscillation speed. The system includes adaptive welding procedures developed for the two shipyard applications and based on procedures used at NGNN and EB. Final development and validation of welding parameters has led to a successful demonstration at EB.

### ***Implementation and Technology Transfer:***

Successful system development will result in implementation of adaptive welding at General Dynamics Electric Boat Corporation in support of construction of SSN attack submarines. The NJC Teaching Factory will facilitate commercialization and transfer of the newly developed technology to other shipbuilders, the Navy, and other U.S. industries.

### ***Expected Benefits:***

The direct benefit of this project to the Navy is reduced acquisition costs and increased productivity for submarine and aircraft carrier construction. The implementation of adaptive welding will reduce costs, increase reliability, and improve the quality of arc welding operations for Navy submarines and surface ships. Adaptive mechanized welding technology will place fewer demands on the operator by permitting increased use of automation with optimized welding processes that result in increased arc on-time, higher welding speeds, improved throughput, reduced construction schedules and reduced weld distortion. The



results are estimated to increase arc on-time by 100 percent and improve first time quality by 50 percent compared to present baselines.

## TIME LINE / MILESTONE

Start Date: January 1999

End Date: March 2004

## FUNDING

Total ManTech Investment: \$2.1M

Industry Cost Share: \$53K

## PARTICIPANTS

Edison Welding Institute (EWI)  
General Dynamics Electric Boat (EB)  
Northrop Grumman Newport News (NGNN)  
BWX Technologies  
Servo-Robot  
NAVSEA  
NSWC-CD